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VEHICLE LOADER MECHANISM

FIELD OF THE INVENTION

This invention relates to lift devices.

More particularly, the present invention relates to devices for lifting loads into/onto a vehicle.

In a further and more specific aspect, the instant invention concerns mounting a lift device in a vehicle for lifting loads into the vehicle.

BACKGROUND OF THE INVENTION

Transport of goods in loads heavy enough to make manual loading undesirable has long been an area of innovation. Forklifts of many types are commonly and successfully employed to load heavy pallets of goods onto trailers and into trucks. The problem with using a forklift is that there needs to be one at the loading area and at the unloading area. Forklifts can be costly. Smaller operations may not have a forklift, and simply apply manual labor to load smaller vehicles. Smaller vehicles such as pick-up trucks and delivery vans may only take one pallet,

1 making use of a forklift prohibitively expensive. Also, the
2 smaller loads are most likely being delivered to a small
3 business or even a private residence. Since only small
4 loads are being delivered, a forklift is probably not
5 present. Therefore, when smaller vehicles are being loaded
6 or unloaded, manual labor is still employed.

7

8 It would be highly advantageous, therefore, to remedy
9 the foregoing and other deficiencies inherent in the prior
10 art.

11 Accordingly, it is an object of the present invention
12 to provide new and improved vehicle loading mechanism.

13

14 Another object of the invention is to provide a vehicle
15 loading mechanism that can be carried by the vehicle.

16

17 Another object of the invention is to provide a vehicle
18 loading mechanism which can be employed on small vehicles
19 such as pick-up trucks and vans.

20

21 And another object of the invention is to provide a
22 loader mechanism which will remain level.

1 Still another object of the present invention is to
2 provide a loader mechanism that includes fail safes to
3 prevent improper operation.

SUMMARY OF THE INVENTION

Briefly, to achieve the desired objects of the instant invention in accordance with a preferred embodiment thereof, provided is a vehicle loader mechanism mountable on a vehicle having a cargo deck for lifting loads onto the cargo deck. The vehicle loader mechanism includes a base mountable on the cargo deck of the vehicle and a lift mechanism movable between a lowered position and a raised position. A drive linkage is coupled between the base and the lift mechanism and movable between an extended configuration and a retracted configuration for lateral movement of the lift mechanism. A leveling linkage is coupled between the base and the lift mechanism for movement with the drive linkage and to prevent tilting of the lift mechanism during movement of the drive linkage between the extended configuration and the retracted configuration. A cylinder is coupled to the drive linkage for moving the drive linkage between the extended configuration and the retracted configuration.

In a more specific aspect, a vehicle loader mechanism carried by a vehicle having a cargo deck is provided and includes a base mounted on a cargo deck of a vehicle and a lift mechanism movable between a lowered position and a

1 raised position. A frame is pivotally coupled to the base
2 and terminates in an end. A first drive linkage and a
3 second drive linkage are coupled in parallel between the
4 base and the lift mechanism and movable between an extended
5 configuration and a retracted configuration for lateral
6 movement of the lift mechanism. Each includes a drive link
7 pivotally coupled to the base and a drive arm pivotally
8 coupled to the drive link and the lift mechanism. A rod is
9 journaled concurrently through the drive arm of the first
10 drive linkage, the end of the frame and the drive arm of the
11 second drive linkage. A first leveling linkage and a second
12 leveling linkage are coupled in parallel between the base
13 and the lift mechanism to prevent tilting of the lift
14 mechanism during movement of the first drive linkage and the
15 second drive link between the extended configuration and the
16 retracted configuration. Each includes a leveling link
17 pivotally coupled to the base, a stop link pivotally coupled
18 to the leveling link and the rod, and a leveling arm
19 pivotally coupled to the stop link and the lift mechanism.
20 A cylinder is coupled between the base and the frame for
21 moving the first drive linkage and the second drive linkage
22 between the extended configuration and the retracted
23 configuration.

1 Also provided in yet another aspect is a lift mechanism
2 that is enabled with the drive linkage in the retracted
3 configuration and the extended configuration, and disabled
4 with the drive linkage in between the extended configuration
5 and the retracted configuration. The lift mechanism is
6 enabled and disabled by signals from limit switches mounted
7 proximate the cylinder.

1 BRIEF DESCRIPTION OF THE DRAWINGS

2
3 The foregoing and further and more specific objects and
4 advantages of the instant invention will become readily
5 apparent to those skilled in the art from the following
6 detailed description of a preferred embodiment thereof taken
7 in conjunction with the drawings, in which:

8
9 FIG. 1 is a perspective view of a vehicle carrying a
10 vehicle loader mechanism according to the present invention,
11 shown in an extended configuration;

12
13 FIG. 2 is a perspective view of the vehicle loader
14 mechanism of FIG. 1, illustrated in an extended
15 configuration;

16
17 FIG. 3 is an enlarged perspective view of a portion of
18 the base with coupled linkages;

19
20 FIG. 4 is an enlarged perspective view of the linkages
21 coupled to the support rod and frame;

22
23 FIG. 5 is a side view of the vehicle loader mechanism
24 of FIG. 1, illustrated in a retracted configuration;

1 FIG. 6 is an enlarged perspective view of a portion of
2 the lift mechanism according to the present invention;

3

4 FIG. 7 is a perspective view of the platform mounts of
5 the lift mechanism;

6

7 FIGS. 8A-8C are simplified side view of the loader
8 mechanism moving from a retracted configuration to an
9 extended configuration in sequence;

10

11 FIG. 9 is an enlarged perspective view of a lower
12 portion of a limit system;

13

14 FIG. 10 is an enlarged perspective view of an upper
15 portion of a limit system;

16

17 FIG. 11 is a partial front view of the lift mechanism
18 of the present invention;

19

20 FIG. 12 is a perspective view of a portion of the lift
21 mechanism, illustrating a limit switch;

22

23 FIG. 13 is an enlarged partial perspective view
24 illustrating a control unit;

1 FIG. 14 is a top plan of a hand unit;

2

3 FIG. 15 is a perspective view of the hand unit of FIG.

4 14;

5

6 FIG. 16 is a partial perspective view of a loader

7 mechanism reciprocally mounted on a track; and

8

9 FIG. 17 is a sectional side view of a locking pin

10 securing the base to a track.

1 DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

2

3 Turning now to the drawings in which like reference
4 characters indicate corresponding elements throughout the
5 several views, attention is first directed to FIG. 1 which
6 illustrates a vehicle loader mechanism generally designated
7 10, carried by a vehicle 12. Loader mechanism 10 is
8 intended to facilitating lifting loads into/onto vehicle 12,
9 and includes an extension assembly 14, movable between an
10 extended configuration in the direction of arrow A, and a
11 retracted configuration, and a lift mechanism 16 movable
12 between a lowered position in the direction of arrow B and
13 as raise position. In this embodiment, vehicle 12 is a
14 pick-up truck having a cab 17 and a bed 18. Loader
15 mechanism 10 is mounted in bed 18 of vehicle 12 and is
16 employed to lift loads onto the cargo deck, which is bed 18
17 in this embodiment. Although the tailgate of the pick-up
18 truck illustrated is not present, it can be attached in the
19 normal manner and simply opened so as to use loader
20 mechanism 10, in accordance with the teachings of the
21 invention. One skilled in the art will understand that
22 while a pick-up truck is illustrated in this embodiment,
23 substantially any type of vehicle having different cargo
24 decks, such as flat bed trucks, vans, delivery trucks,
25 trailers and the like, can employ loader mechanism 10.

1 With additional reference to FIGS. 2 and 5, extension
2 assembly 14 of loader mechanism 10 includes a base 20
3 supporting a pair of drive linkages 22 and 23 and a pair of
4 leveling linkages 24 and 25. Base 20 is a rectangular
5 framework of steel tubing having a forward end 27, a
6 rearward end 28 and opposing sides 29 and 30. For purposes
7 of orientation, the terms forward and rearward are defined
8 relative the movement of extension assembly 14 from base 20.
9 Forward is the direction in which the extension assembly
10 extends, and rearward is the direction of retraction toward
11 base 20. In this embodiment, rearward end 28 of base 20 is
12 adjacent cab 18 with extension assembly 14 extending toward
13 the rear of bed 18. The orientation is described relative
14 the motion of extension assembly 14 because the orientation
15 of loader mechanism 10 on a vehicle can be altered. For
16 example, while the extension of extension assembly 14 is
17 directly rearward with respect to vehicle 12 in the present
18 embodiment, one skilled in the art will understand that a
19 different vehicle, such as a flat bed truck, can carry
20 loader mechanism 10 so as to allow extension of extension
21 assembly 14 in a sidewise direction. It should also be
22 understood that while a tubular framework is employed in
23 this preferred embodiment, base 20 can also be formed of
24 plates or the like. The intention of base 20 is to provide
25 a coupling between loader mechanism 10 and vehicle 12 and to

1 provide a stable platform upon which the drive linkages and
2 the leveling linkages pivot.

3

4 Each drive linkage of the pair and each leveling
5 linkage of the pair is substantially identical. Since each
6 of the linkages is generally identical, only one of each
7 will be described in detail with corresponding reference
8 characters applying to each. Still referring to FIGS. 2 and
9 5, and with additional reference to FIGS. 3 and 4, drive
10 linkage 22 includes a drive link 32 having an end 33
11 pivotally coupled to rearward end 28 of base 20 proximate
12 side 29 and an end 35. A drive arm 37 has an end 38
13 pivotally coupled to end 35 of drive link 32 and terminates
14 in an end 39 pivotally coupled to lift mechanism 16. Drive
15 arm 37 includes an angle therein, intermediate ends 38 and
16 39. An aperture is formed through drive link at the angle
17 and defined by a collar 40. Drive link 32 of drive linkage
18 23 is pivotally coupled to side 30, and drive arm 37 of
19 drive linkage 23 is pivotally coupled to an opposing side of
20 lift mechanism 16, such that drive linkage 23 is in parallel
21 with drive linkage 22. A support rod 41 extends between
22 drive arms 37 of drive linkages 22 and 23, having ends
23 journaled within collars 40 of each, to provide rigid
24 separation and support for drive linkages 22 and 23.

1 Leveling linkage 24 includes a leveling link 42 having
2 an end 43 pivotally coupled to rearward end 28 of base 20
3 forward of drive link 32, proximate side 29, and an end 45.
4 A stop link 47 includes an end 48 pivotally coupled to end
5 45 of leveling link 42 and an opposing end terminating in a
6 collar 49 receiving support rod 41. A leveling arm 52 has
7 an end 53 pivotally coupled to stop link intermediate end 48
8 and collar 49 and terminates in an end 55 pivotally coupled
9 to lift mechanism 16 rearward of drive arm 37. Leveling
10 link 42 of leveling linkage 25 is pivotally coupled to side
11 30, and leveling arm 52 of leveling linkage 25 is pivotally
12 coupled to an opposing side of lift mechanism 16, such that
13 leveling linkage 25 is in parallel with leveling linkage 24.
14

15 Extension assembly 14 is stabilized and strengthened by
16 a frame 60 having an end 62 pivotally coupled to forward end
17 27 of base 20 and an end terminating in a pair of spaced
18 apart collars 64. Support rod 41 is journaled within
19 collars 64 which are in turn position inboard of stop links
20 47 of leveling linkages 24 and 25. Frame 60 supports rod 41
21 and maintains it at a constant distance from base 20. Thus,
22 rod 41 acts as a fulcrum for drive arms 37 and positions
23 stop links 47 to maintain the positioning of leveling
24 linkages 24 and 25 relative drive linkages 22 and 23 to keep
25 lift mechanism 16 level, as will be described presently.

1 Frame 60 includes an intermediate brace 66 which is acted
2 upon by a motor to move extension assembly 14 between the
3 extended and the retracted configurations. In this
4 embodiment, the motor is a double acting cylinder 68 of
5 either pneumatic or hydraulic type, although a ball screw
6 drive-type can be used as well as other cylinder forms or
7 like motors or drive assemblies operable between extended
8 and retracted configurations. Cylinder 68 is carried by
9 base 20 proximate rearward end 28, intermediate sides 29 and
10 30, and includes a piston 69 terminating in a coupling with
11 intermediate brace 66. Extension and contraction of
12 cylinder 68 moves extension assembly 14 into the extended
13 configuration (FIG. 2) and retracted configuration (FIG. 5),
14 respectfully.

15

16 Still referring to FIGS. 2 and 5, lift mechanism 16 is
17 preferably of the type commonly known as a multiple mass
18 lift. While the preferred embodiment illustrates a triple
19 mass lift double mass lifts and the like can also be
20 employed. Additionally, one skilled in the art will
21 understand that substantially any vertical lift mechanism,
22 such as those employed in fork lifts can be used. Lift
23 mechanism 16 is well known in the art and will not be
24 described in detail other than to describe modifications and
25 elements interacting with extension assembly 14. A pair of

1 vertical frame members 70 are employed which terminate in
2 lower ends 72. Ends 39 of lift arms 37 are pivotally
3 coupled to lower ends 72, providing the motive force moving
4 lift mechanism 16 into a deployed condition wherein
5 extension assembly 14 is in the extended configuration, and
6 a stored condition wherein extension assembly 14 is in the
7 retracted configuration. Horizontally extending levers 74
8 extend rearwardly from lower ends 72 and are pivotally
9 coupled to ends 55 of leveling arms 52. In this manner,
10 lift mechanism 16 is maintained in a level or horizontal
11 position as extension assembly 14 moves it between the
12 deployed condition and the stored condition.

13

14 While not described in detail, lift mechanism 16
15 includes a transverse housing 76 extending between upper
16 ends of frame members 70 and carrying actuating mechanisms
17 as well as forming a rigid framework. Telescoping members
18 77 engage frame members 70 and are extended by the actuating
19 mechanisms which, in this embodiment, are electric motors 78
20 having a 50-1 reduction gearing. Members 77 are coupled to
21 motors 78 by a cross piece 73 and a belt 75. Platform
22 mounts 80 extend forwardly from lower ends 79 of the
23 innermost member 77, and are employed to receive pallets or
24 other loads to be lifted into bed 18. With additional
25 reference to FIGS. 6 and 7, platform mounts 80 are carried

1 by a rod 82 coupled to lower ends 79 of innermost member 77.
2 Mounts 80 are movable from a lowered, horizontal position to
3 a substantially vertical position in the direction of arrows
4 C. Movement downward is halted at the horizontal position
5 by stops 84.

6
7 Referring now to FIGS. 8A, 8B and 8C, the sequential
8 process of lifting a load is illustrated. With reference
9 specifically to FIG. 8A, loader mechanism 10 is shown in the
10 retracted configuration with lift 16 in the stored
11 condition. The first step in lifting a load is moving
12 platform mounts 80 to the horizontal position. The movement
13 of loader mechanism 10 to the extended position is
14 illustrated in FIG. 8B. Cylinder 68 is extended, pivoting
15 frame 60 forwardly and extending drive linkages 22 and 23.
16 Extension of drive linkages 22 and 23 moves lift mechanism
17 16 forwardly in the direction of arrow D. Platform mounts
18 80 are maintained in a horizontal orientation, and vertical
19 frame members 70 are maintained in a vertical orientation by
20 leveling linkages 24 and 25 which influence lift mechanism
21 16 through levers 74. The position of leveling linkages 24
22 and 25 relative drive linkages 22 and 23 by stop links 47
23 maintain the level attitude of lift mechanism 16. Upon
24 reaching the extended configuration, as illustrated in FIG.
25 8C, lift mechanism 16 is lowered to receive a load. The

1 load can then be raised, and cylinder 68 retracted, pulling
2 the load onto bed 18. Once extension assembly 14 reaches
3 the fully retracted configuration, lift mechanism 16 can
4 lower the load onto bed 18 for transportation.

5

6 To prevent unintentional and potentially damaging
7 movement of loader mechanism 10 at inappropriate times,
8 limit switches can be employed. To prevent lowering of lift
9 mechanism 16 when it is still over the cargo body of a
10 vehicle, motors 78 are disabled until full extension. At
11 full extension a switch is triggered which enables motors 78
12 to operate. Additionally, a switch can be utilized to
13 enable motors 78 to operate when full retraction of
14 extension assembly 14 is achieved. This permits lift
15 mechanism 16 to be lowered to the cargo deck, such as bed
16 18, so that the weight of the load does not need to be
17 maintained by loader mechanism 10 during transport.
18 Conversely, when motors 78 operate and lift mechanism is in
19 other than the lifted position, movement of extension
20 assembly 14 is prevented by disabling cylinder 68.

21

22 Turning to FIGS. 9 and 10, a telescoping rod including
23 a fixed portion 90 is couple proximate the base of cylinder
24 68 and a reciprocating portion 92 is coupled to brace 66
25 proximate piston 69. Reciprocating portion 92 carries tabs

1 94 and 96 which move with the extension and retraction of
2 cylinder 68. In this manner, when cylinder 68 is fully
3 retracted, and extension assembly 14 is in the retracted
4 configuration, tab 94 triggers a switch 102 which enables
5 motors 78. As cylinder 68 extends, tab 94 triggers switch
6 102 again to disable motors 78. As extension of cylinder 68
7 continues, tab 94 contacts switch 102 when full extension is
8 achieved, enabling motor 78 again. Thus, motor 78 are
9 enabled at full extension and full retraction, but disabled
10 in between to prevent lowering of lift mechanism 16 during
11 the extension or retraction process. One skilled in the art
12 will understand that one or more switches may be employed as
13 desired.

14

15 Referring to FIGS. 11 and 12, lift mechanism 16 is
16 illustrated in the raised position. In this position, cross
17 piece 73 engages and actuates a switch 105 which enables
18 cylinder 68. When lift mechanism 16 is moved toward the
19 lowered position, cross piece 73 disengages switch 105,
20 disabling cylinder 68.

21

22 To facilitate operation of loader mechanism 10, a
23 control unit 110 is provided to receive signals from the
24 limit switches and control the operation of cylinder 68 and
25 motors 78 as seen in FIG. 13. Operator control signals are

1 also received by control unit 110. These signals can be
2 generated by a hand unit 112 as shown in FIGS. 14 and 15.
3 Preferably, hand unit 112 includes a toggle switch 114 which
4 controls the extension and retraction of extension assembly
5 14 by extending or retracting cylinder 68 through control
6 unit 110. Another toggle switch 116 controls the raising
7 and lowering of lift mechanism 16 by actuating motors 78
8 through control unit 110.

9

10 Turning now to FIG. 16, loader mechanism 10 can be
11 mounted on a track for reciprocation. This can be utilized
12 for long cargo decks such as trailers. The effective reach
13 of loader mechanism 10 is increased by reciprocal movement
14 of the entire mechanism rearwardly or forwardly as desired.
15 A pair of parallel tracks 120 is fixedly mounted on the
16 cargo deck being utilized. Base 20 is modified to include
17 bearings 122 extending from the underside of base 20 and
18 received within a slot 124 formed in each rail 120. The top
19 of slot 124 is narrowed to prevent the removal of bearing
20 122 vertically therefrom. Thus, bearings 122 freely slide
21 or roll within tracks 120 while loader mechanism 10 remains
22 firmly anchored to the cargo deck. With additional
23 reference to FIG. 17, apertures 126 extend transversely
24 through tracks 120 periodically along their length.
25 Apertures 128 are formed in bearings 122 and can be aligned

1 with apertures 126. When loader mechanism 10 is positioned
2 in a desired location on tracks 120, a pin 130 is inserted
3 concurrently through aperture 126 and 128, securing loader
4 mechanism 10 in place. It should be understood that loader
5 mechanism 10 can be manually moved along tracks 120 and
6 motorized as desired. Additionally, bearings 122 can be
7 slide bearings, wheels, ball bearing, rollers, or the like.

8

9 Accordingly, a new and improved vehicle loading
10 mechanism has been provided which can be carried by a small
11 vehicle such as a pick-up truck, van, etc., and which will
12 remain level during operation. Additionally, the loader
13 mechanism can include fail safes to prevent improper
14 operation. The loader mechanism herein disclosed can be
15 used to transport any variety of load, and is especially
16 useful and convenient for transporting handicapped
17 individuals, such as those confined to wheelchairs, to and
18 from a vehicle cargo deck.

19

20 Various changes and modifications to the embodiments
21 herein chosen for purposes of illustration will readily
22 occur to those skilled in the art. To the extent that such
23 modifications and variations do not depart from the spirit
24 of the invention, they are intended to be included within
25 the scope thereof which is assessed only by a fair

1 interpretation of the following claims.

2

3 Having fully described the invention in such clear and
4 concise terms as to enable those skilled in the art to
5 understand and practice the same, the invention claimed is: